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ARCHIVES OF PEDIATRICS

A MONTHLY DEVOTED TO THE

DISEASES OF INFANTS AND CHILDREN

JOHN FITCH LANDON, M.D., Editor

LEADING ARTICLES IN THIS NUMBER

E. B. TREAT & CO., Inc., *Publishers*, 45 East 17th Street, NEW YORK, 3
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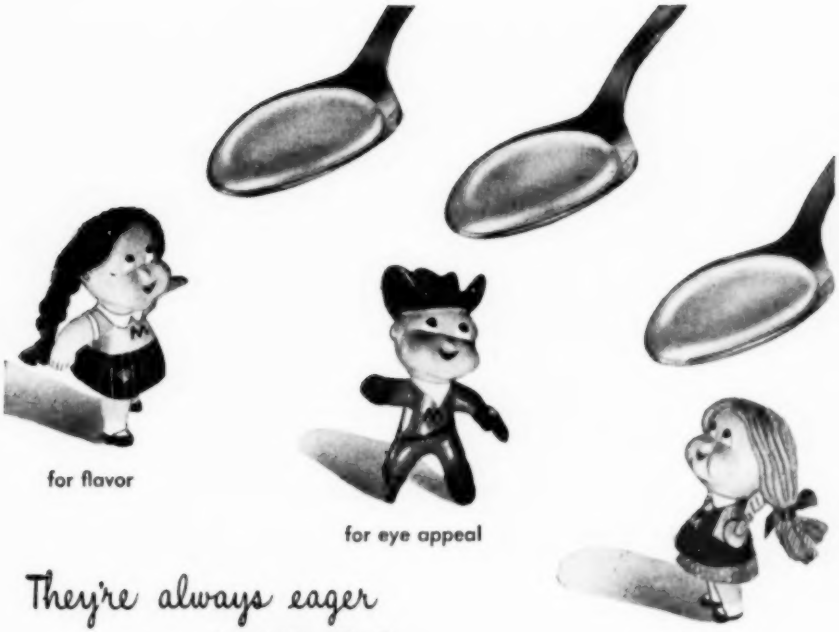

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Good-tasting Mulcin is free-flowing and convenient to use from mother's point of view. *And* Mulcin supplies well balanced amounts of all the vitamins *for which daily requirements have been established.* No need to refrigerate either. Its potency is assured even at room temperature.

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Vitamin A	3000 units
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Ascorbic acid	50 mg.
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Niacinamide	8 mg.

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Evansville, Indiana, U.S.A.

Two years ago, findings of importance to dietitians everywhere were published, emphasizing the superiority of reconstituted MINUTE MAID Fresh-Frozen Orange Juice over home-squeezed juice of the same type oranges, in three respects:

(a) *Average levels of ascorbic acid significantly higher in* MINUTE MAID: Obviously, this advantage of MINUTE MAID, observed in the samples tested, is susceptible to variation, from season to season, as crops differ. It should be emphasized, however, that, penny for penny and year after year, the lower-priced MINUTE MAID offers the housewife *more* ascorbic acid than she could get from home-squeezed orange juice.

(b) *Peel oil content significantly lower:* Samples of orange juice, home-squeezed by typical housewives, showed contents of peel oil, a cause of allergic response and poor tolerance, especially in infants, were up to 700% higher than in MINUTE MAID!

(c) *Bacterial counts dramatically lower:* Bacterial counts were found to be as high as 350,000 per ml. in home-squeezed samples, but were uniformly low in MINUTE MAID.

Since publication of the above findings, more and more physicians are recommending MINUTE MAID Fresh-Frozen Orange Juice in place of home-squeezed orange juice where optimum year-around intake of natural Vitamin C is indicated.

And now comes more evidence in favor of MINUTE MAID . . .

New Assays Reaffirm Dietary Advantages of Minute Maid Fresh-Frozen Orange Juice on a Cost Basis

A second report comparing the individual mineral and vitamin values of MINUTE MAID Fresh-Frozen Orange Juice and home-squeezed juice of the same type oranges has recently been published.

In this latest study, each sample was analyzed separately. The analyses showed that MINUTE MAID Fresh-Frozen Orange Juice was equal to, or superior to, the home-squeezed juice in *all* of the components listed below:

TABLE

Mean Values in Samples Tested

COMPONENT	UNITS	MINUTE MAID FRESH-FROZEN ORANGE JUICE	HOME-SQUEEZED ORANGE JUICE
Betaine	mg./100 ml.	49	46
Biotin	mcg./100 ml.	0.26	0.26
Choline	mg./100 ml.	12	12
Cobalt	mcg./100 ml.	74	67
Folic acid	mcg./100 ml.	2.2	2.2
Iodine	mcg./100 ml.	0.24	0.21
Manganese	mcg./100 ml.	33	18
Nitrogen			
Total	mg./100 ml.	104	79
Amino	mg./100 ml.	22	22
Volatile	mg./100 ml.	8	7
Non-volatile	mg./100 ml.	96	72
Pantothenic acid	mcg./100 ml.	146	145
Para-amino-benzoic acid	mcg./100 ml.	4	4
Phosphorus	mg./100 ml.	19	18
Potassium	mg./100 ml.	380	290
Riboflavin	mcg./100 ml.	18	17
Tocopherols	mg./100 ml.	107	104
Vitamin A	mcg./100 ml.	19	16
Thiamine	mcg./100 ml.	87	83
Vitamin B_{12}	mcg./100 ml.	0.0032	0.0012

Although the results are again susceptible to variation according to crop and year, Fresh-Frozen MINUTE MAID was equal to the home-squeezed juice in the samples tested for the largest number of components listed; and in the mean values for iodine, manganese, potassium, Vitamins A and B_{12}, MINUTE MAID showed appreciably *higher* values.

SUMMARY

These new findings help enlarge professional knowledge of the nutrient constituents of orange juice in general and add fresh evidence that, on a cost basis, MINUTE MAID Fresh-Frozen Orange Juice has significant dietary advantages. Penny for penny, MINUTE MAID offers not only *more* Vitamin C, but also *more* of all the other vitamins and minerals listed than home-squeezed orange juice.

Taken in conjunction with the previously published findings, this should confirm the choice of physicians who recommend MINUTE MAID in place of home-squeezed orange juice.

REFERENCES:

(1) Rakieten, M. L., *et al.*, Journal of the American Dietetic Association, October, 1951.
(2) Joslin, C. L., and Bradley, J. E., Journal of Pediatrics, Vol. 39, No. 3, pp. 325-329 (1951).
(3) Rakieten, M. L., *et al.*, Journal of the American Dietetic Association, November, 1952.
(4) Assn. Official Agricultural Chemists: Methods of Analysis, 7th ed. Washington: Assn. Off. Agric. Chemists, 1950.

Reference #3 still available in reprint form.

MINUTE MAID CORPORATION,
488 Madison Ave., N.Y. 22, N.Y.

WALLACE R. ROY, Ph.D.,
Director of Research

TO CONTRIBUTORS AND CORRESPONDENTS OF

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CONTENTS

ORIGINAL COMMUNICATIONS

(Continued on page 5)

A COMPARISON OF SULFONAMIDE PREPARATIONS:

Capacity to Produce Adequate, Sustained Blood Levels

From a Recent Report: "The Effect of an Alumina Gel Vehicle on the Blood Level of a Triple Sulfonamide Preparation after Oral Administration."[1]

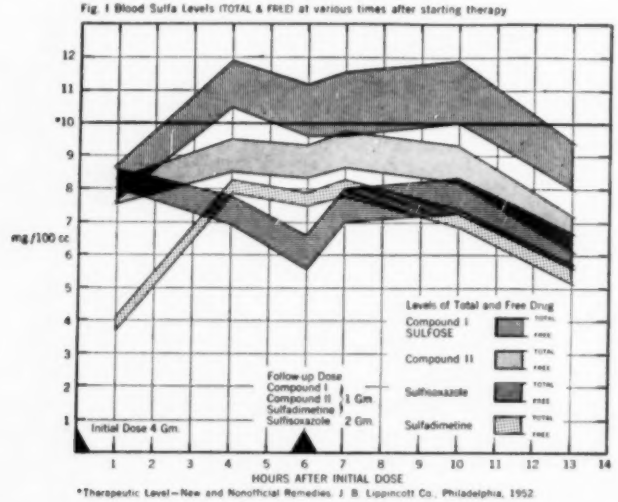
"In accordance with the standards established by the Council on Pharmacy and Chemistry of the American Medical Association[2] regarding therapeutic blood levels, it was deemed advisable to judge the effectiveness of the various preparations on the basis of their ability to provide sustained blood sulfonamide concentrations of 10 to 15 mg. per 100 cc."

Four sulfonamide preparations were studied:

(a) SULFOSE®—triple sulfonamides in alumina gel suspension
(b) Compound II—triple sulfonamides without alumina gel
(c) Sulfisoxazole tablets
(d) Sulfadimetine tablets

For details on dosage and comparative blood levels obtained, see chart below.

Fig. 1 Blood Sulfa Levels (TOTAL & FREE) at various times after starting therapy



*Therapeutic Level—New and Nonofficial Remedies, J. B. Lippincott Co., Philadelphia, 1952.

RESULTS

1. Only one preparation—SULFOSE—produced average blood levels exceeding 10 mg. total sulfonamides per 100 cc.
2. Average acetylation was moderate for all preparations, ranging around 10 per cent (±5 per cent).
3. Triple sulfonamides produce greater and better sustained blood levels.
4. SULFOSE—*triple sulfonamides in alumina gel suspension*—provided both "higher initial as well as more prolonged therapeutic levels . . ."[1]

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Triple Sulfonamides

SUPPLIED: Suspension, bottles of 1 pint. Each 5 cc. teaspoonful contains 0.167 Gm. each of sulfadiazine, sulfamerazine and sulfamethazine in a special alumina gel vehicle.

Also available: Tablets, bottles of 100 and 1000.

References: 1. Berkowitz, D.: Antibiotics & Chemotherapy 3:618 (June) 1953.
2. New and Nonofficial Remedies. J.B. Lippincott Company, Philadelphia, 1952, p. 103.

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(Continued from page 3)

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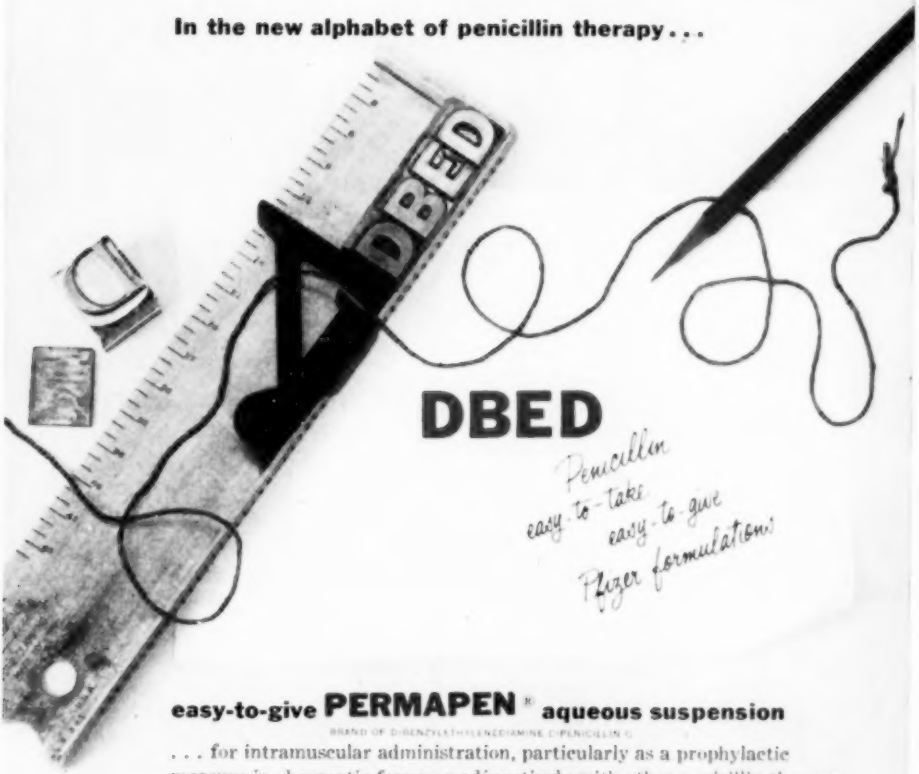

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why

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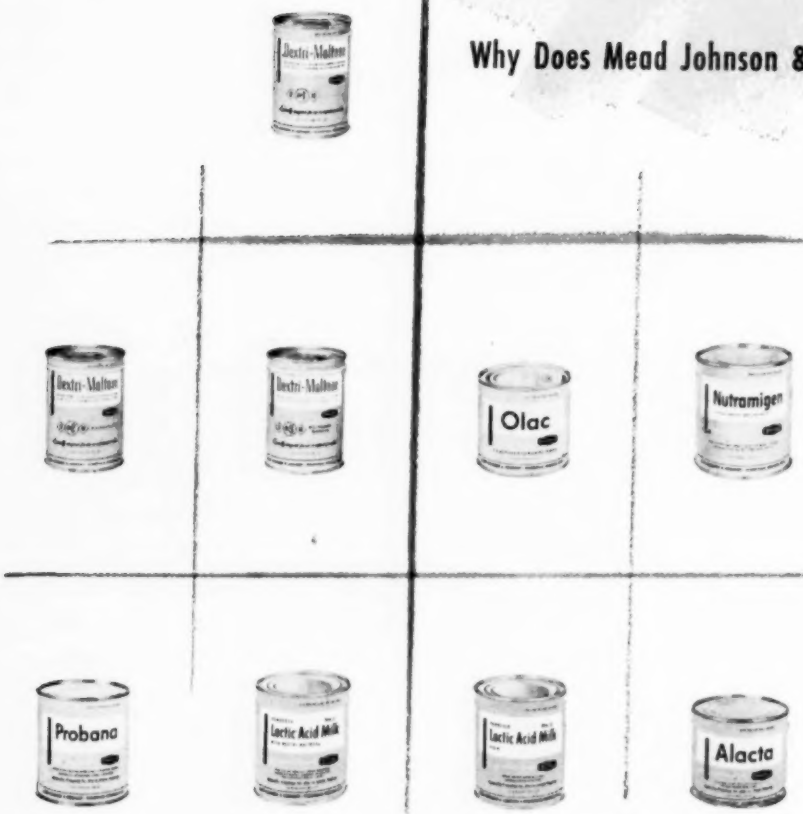

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13?

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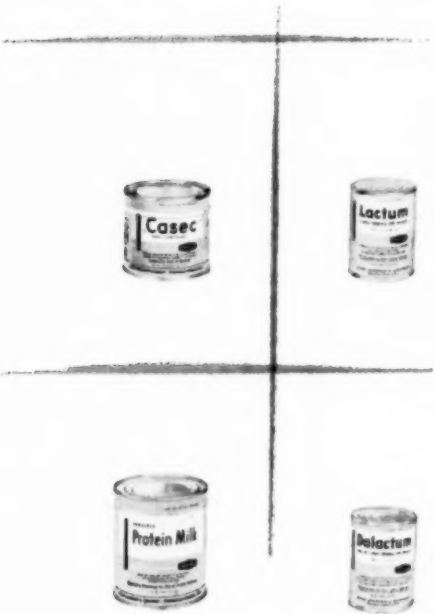

In the important field of infant nutrition, for nearly half a century, Mead Johnson & Company has endeavored to provide physicians with a group of formula products designed to meet every possible individual nutritional requirement of babies that might be encountered in daily practice.

This means not only the manufacture of basic formula products for normal healthy infants but also the development of products to help solve the wide variety of difficult feeding problems that constantly occur. Such a goal can be achieved only through wide experience and through diversification of research projects to encompass the full scope of infant nutrition.

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This is a fundamental phase of the policy to which Mead Johnson & Company is dedicated — that of serving the medical profession. This is and always will be the most important product of our Company.

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For fractional dosage: 100,000-unit tablets; bottles of 100

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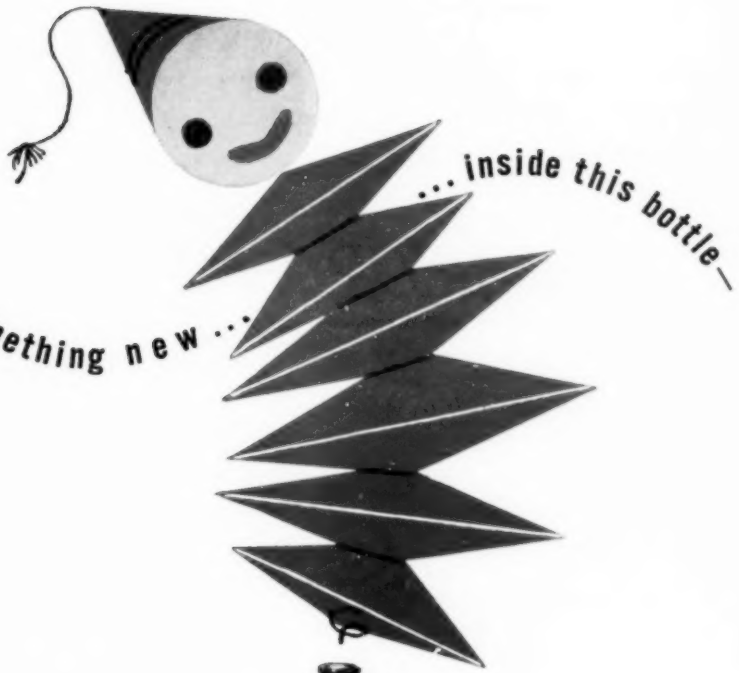

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new, pleasant-tasting liquid vitamin preparation

The delicious orange flavor of this new non-alcoholic, aqueous vitamin preparation is so pleasing, and its orange-juice color and aroma so tempting, that most children just can't resist it.
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Each 4-cc. teaspoonful of PALADAC provides:

Vitamin A	5,000 units
Vitamin D	1,000 units
Vitamin C (ascorbic acid)	50 mg.
Vitamin B_1 (thiamine hydrochloride)	3 mg.
Vitamin B_2 (riboflavin)	3 mg.
Nicotinamide	20 mg.
Pantothenic Acid (as sodium salt)	5 mg.
Vitamin B_6 (pyridoxine hydrochloride)	1 mg.
Vitamin B_{12} Crystalline	5 mcg.

Dosage:
Infants, ½ teaspoonful daily; children and adults, one teaspoonful daily or more, as directed by the physician.
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Each 0.6 cc. of Poly-Vi-Sol supplies:

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Vitamin D	1000 units
Ascorbic acid	50 mg.
Thiamine	1 mg.
Riboflavin	0.8 mg.
Niacinamide	6 mg.

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it ventilates . . .

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- Tracheotomy area always free.
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1. Heimer, C. B., Grayzel, H. G. and Kramer, B.: Archives of Pediat. 68:382, 1951.
2. Behrman, H. T., Combes, F. C., Bobroff, A. and Leviticus, R.: Ind. Med. & Surg. 18:512, 1949.

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Ferrous Sulfate, Exsiccated	200 mg.
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Each 5-cc. teaspoonful of VI-DAYLIN contains:

Vitamin A	3000 U.S.P. units
Vitamin D	800 U.S.P. units
Thiamine Hydrochloride	1.5 mg.
Riboflavin	1.2 mg.
Ascorbic Acid	40 mg.
Vitamin B_{12} Activity (by microbiological assay)	3 mcg.
Nicotinamide	10 mg.

Better stand back when Mom sounds the call for Vi-Daylin. Kids really scoot for this delicious multivitamin's honey-yellow shine, fresh citrus flavor and lemon-candy goodness.

With seven important vitamins—including 3 mcg. of body-building B_{12}—in every lip-smacking spoonful, more and more physicians are calling for Vi-Daylin for their little patients.

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Abbott

1-208B

ARCHIVES OF PEDIATRICS

VOL. 70 OCTOBER 1953 No. 10

JOHN FITCH LANDON, M.D., Editor

INTRAMUSCULAR TERRAMYCIN IN TREATMENT OF MENINGITIS*

REPORT OF 21 RECOVERIES

ARCHIBALD L. HOYNE, M.D.,
Chicago,
AND
DAVID L. SIMON, M.D.,
St. Louis.

Since the development and availability of the various antibiotics, penicillin has led the field in suitability for intramuscular injection. When prescribed in that manner it is effective especially for pneumococcic infections, and we have also brought about recoveries when it was the sole remedy for meningococcic meningitis. Nevertheless, massive doses of penicillin are required for such therapy and combined methods of treatment are more rapidly effective. Streptomycin and dihydrostreptomycin may also be injected in the muscle and be well tolerated, although occasionally areas of induration develop. But none of these remedies alone can be classified as ideal for any form of acute purulent meningitis.[1]

Originally it was stated[2] that when terramycin was administered systemically the drug did not readily enter the cerebrospinal fluid. Quite likely it was on account of that opinion that terramycin had been neglected as an exceptionally effective therapeutic weapon against several forms of meningitis.

The latter fact was demonstrated in a report[3] of 14 recovered patients whose only medication was terramycin. The success at-

*From Cook County Contagious Disease Hospital.

tained with this antibiotic emphasized again a remark which one of the writers has repeatedly made during many years: "In a case of meningitis it is the patient who requires treatment not merely the cerebrospinal fluid."[4]

With the foregoing thought in mind, we were greatly pleased when a supply of terramycin for intramuscular injection was made available to us.* In so far as we know this new preparation was not designed for the treatment of any particular disease but for the purpose of combating organisms which are sensitive to this antibiotic. Assuming that the drug would be used only when properly indicated, our main objectives in undertaking this investigation were two-fold: (1) To determine muscle tolerance to terramycin, and (2) to evaluate its effectiveness by that route when treating meningitis patients. We had also hoped to obtain blood and spinal fluid levels for every patient.

On account of favorable experience with terramycin, it was decided to confine our study to meningitis patients, all of whom were treated during the present year (1953). The period of illness prior to hospitalization varied from one day to a week. In the accompanying table the disease treated, age of patient, number of intramuscular injections and other information appear. Nevertheless, it may be of interest to present briefly additional details to illustrate facts concerning individual patients. Following are some extracts intended to serve that purpose.

CASE REPORTS

Case 1. A 22-months-old negro baby was admitted May 8. Laboratory diagnosis H. influenzae in spinal fluid. Treatment begun with magnamycin 125 mg. every 6 hours intravenously for 4 days. Medication then changed to intramuscular terramycin 250 mg. every 6 hours until May 22 when complete recovery was apparent. During therapy patient had diarrhea for 3 days. There were no local reactions from the 36 injections. Patient kept in hospital an additional week for observation. There was no evidence of sequelae.

Case 2. Nine-year-old negro girl with meningococcic meningitis admitted May 14. Initial medication 500 mg. terramycin intravenously. Then intramuscular terramycin 250 mg. every 6 hours

*Supplied by Chas. Pfizer & Co., Inc.

for 5 days (20 doses). Had diarrhea 2 days. Developed tenderness in both thighs and both buttocks after 12th and 20th injections. Recovery apparent May 19 but had partial deafness. Kept under observation in hospital for additional week. Condition good except for hearing.

21 MENINGITIS PATIENTS TREATED WITH INTRAMUSCULAR TERRAMYCIN

CASE	ORGANISM	AGE	SEX	PETCH.	SMEAR	L.P.	CELLS	SMEAR	CULT.	D.URI.	LOCAL REACTIONS
1	H.Influenzae	22 m	F	0		1	500	-	+	16	None
2	Meningococcus	9	F	+	+	1	4800	+	+	20	Pain and tenderness after 12 and 20 inj.
3	Meningococcus	7 m	F	0		1	7950	+	No Gr.	44	Pain, tenderness, swelling after 35 inj.
4	Meningococcus	13	M	+		1	20000	+	No Gr.	16	None
5	Meningococcus	5	F	0		1	13000	-	+	19	None
6	Meningococcus	13	M	+	+	0				28	None
7	Pneumococcus	42	F	0		1		+	+	24	Slight induration after 11,13,14,15 inj.
8	Meningococcus	17	F	0		1	2000	+	No Gr.	24	None
9	Meningococcus	6	F	0		1	12250	+	+	15	Swelling, pain after 14 inj.
10	Meningococcus	9 M	M	0		1	7068	+	No Gr.	20	None
11	Meningococcus	3	M	+		1	2719		+	14	None
12	Meningococcus	3	M	+		1	13000	+	+	10	None
13	Meningococcus	20	F	+	+	0				11	None
14	Pneumococcus	28	M	0		1	2800	+	+	9	None
15	Purulent*	1	F	0		1	980	--	--	5	None
16	Meningococcus	6 wk	M	0		0?	1966	-	+	7	None
17	Meningococcus	16	M	0		1		+	-	10	None
18	Meningococcus	5	M	0		1	9600	+	+	8	None
19	Pneumococcus	19	M	0		1	16000	+	+	4	None
20	Meningococcus	17m	F	0		1	6000	+	-	12	None
21	Meningococcus	3 M	M	0		1	6800	+	+	12	None

*Probably Meningococcus. Treated with penicillin and aureomycin for one week prior to admission

#Had 1 lumbar and 1 ventricular puncture prior to admission - till 8 days.

+ for Positive
- for Negative
-- no record

Case 3. White female infant, 7 months of age, admitted May 14. Diagnosis meningococcic meningitis. Only medication was terramycin administered intramuscularly. Initial dose was 200 mg. Then 100 mg. every 6 hours for 44 injections. No diarrhea. Tenderness, pain and swelling in buttocks and thighs after 35th injection. No residuals. Recovery good.

Case 4. A 13-year-old negro boy admitted May 19 with meningococcic meningitis. Initial treatment 500 mg. terramycin intravenously every 6 hours for 2 days. Then intramuscular terramycin

250 mg. every 6 hours for 16 injections. Discontinued on May 25 and oral terramycin 250 mg., prescribed every 6 hours for 3 days. No local reactions, nor complications. Recovery good.

Case 5. A 5-year-old negro girl admitted May 29 with meningococcic meningitis. Initial treatment terramycin 250 mg. intravenously every 6 hours for 2 days; then 100 mg. terramycin intramuscularly every 6 hours for 6 days. Diarrhea 2 days. No local reactions. Recovery good.

Case 6. A 15-year-old white boy with numerous petechiae and slight nucal rigidity admitted June 1. Smear from petechiae positive for meningococci. No lumbar puncture. Initial dose of terramycin 500 mg.; then 250 mg.; all medication intramuscularly, 28 injections at 6 hour intervals. No diarrhea, no local reactions. Good recovery.

Case 7. White woman, 42 years of age, 5 months pregnant, admitted June 12, in coma-pneumococcic meningitis. Prior to admission had been treated for 3 days with penicillin, streptomycin and sulfadiazine. Initial dose of terramycin 500 mg. intravenously; then 250 mg. every 6 hours for 24 intramuscular injections. Developed some induration about sites of injections after 13, 14 and 15 doses. Good recovery.

Case 8. Girl, 17 years old, white, admitted June 25. Diagnosis —meningococcic meningitis. Initial dose of terramycin 500 mg. intravenously, then 250 mg. every 6 hours for total of 24 injections intramuscularly. No complications. Good recovery.

Case 9. A 6-year-old negro girl admitted July 1. Meningococcic meningitis. Initial treatment 2 doses of terramycin 250 mg. each, intravenously, 6 hours apart; then 250 mg. intramuscularly every 6 hours for 4 days, followed by same dosage orally for one week. No local reactions. Complication deafness. Otherwise recovery good.

In Cases 10 to 21, inclusive, the method of treatment and the results obtained were similar to those which are briefly cited. Among the 21 patients there were but 4 who had any local reactions regardless of the number of intramuscular injections. Tenderness, induration, swelling or pain that occurred in 4 patients subsided in from 3 to 4 days. There was no abscess formation in any instance.

All terramycin used for intramuscular injection contained 100

mg. per cc. All doses were administered at 6 hour intervals. We are inclined to believe that 8-hour intervals will prove to be satisfactory and are now trying the latter schedule.

DISCUSSION

Terramycin was used exclusively for all 21 patients. Pneumococcic and influenzal infections responded to treatment as effectively as meningococcic. Sites selected for injections were the anteriolateral muscles of the thighs and the buttocks, choosing the different localities in rotation. Our results do not seem to indicate that there was any significant difference on which to base a preference for either of those areas. Nevertheless one of us (A.L.H.) has long been of the opinion that there are definite disadvantages[5] to injections in the buttocks. Recently, some attention has been given to this matter, but Glaser[6] made a study of the subject many years ago.

It may be noted in the table that none of the patients had more than one lumbar puncture.[7] If petechiae were present and smear revealed gram-negative diplococci, no spinal tap was made. Those who continue to worry about intracranial pressure and also the ones who demand frequent, even daily, taps in order to have a laboratory report on the patient's condition, usually are lacking in clinical experience. In connection with this statement we admit it was a disappointment not to have had frequent blood and spinal fluid levels of terramycin. Such information would have been of scientific interest. But its absence did not appear to have had any detrimental influence on the progress made by the patients. Moreover, as we[8] have pointed out, a high concentration of the remedial agent in the cerebrospinal fluid is not as an important factor in the recovery of the patient as generally believed. More recently Drake[9] and associates have demonstrated that fact and cite Bryor[10] et al. as having made a similar observation.

In presenting our experience with intramuscular treatment it is not our intention to imply that this is the method of choice for meningitis therapy. There are now numerous remedies and variations in methods for the successful treatment of meningitis. No one is qualified to set up a standard which others must accept without question. This is particularly true if contrary conclusions of reliable investigators are not given credence and an abundance of

opposing evidence is ignored. Each physician will adopt what he believes to be the optimal treatment. His selection of remedies and methods of administration are likely to be based on his own experience, which may have been quite as extensive as that of others. We believe that intrathecal therapy has no place in any program of optimal therapy for any form of meningitis. Furthermore, regardless of any denial that may be made, there is ample proof that intrathecal treatment can be harmful and is not necessary for the best interests of the patient.

SUMMARY

Twenty-one meningitis patients, whose ages ranged from 6 weeks to 42 years, were treated with intramuscular terramycin. In most instances the initial dose of the drug was given intravenously.

Seventeen of the patients, including 3 who received intramuscular terramycin exclusively, had no local reactions.

Four patients had tenderness, swelling or induration at site of some injections in both buttocks and thighs, all of which subsided within 3 to 4 days. The average number of intramuscular injections for 17 patients with no local reactions was 13.5. For 4 patients with local reactions the average was 25.7 and for all 21 patients the corresponding figure was 18.6. Average number of days medication for all patients while in hospital was 8.4. For each of 4 patients it was but 5 days and for one (Case 8) it was 20 days. All 21 patients made good recoveries, including one with Hemophylus influenzae infection and three with pneumococcus. However, among the 17 with meningococcic meningitis, 2 had some degree of deafness. There were no other complications. In no instance was there any reason to suspect the possibility of subdural effusion. Nor was there anything to suggest cerebral injury at time of hospital discharge. Some of the children were seen several months after recovery and their physical and mental conditions were good.

No patient had more than one intrathecal puncture; 2 patients had none. The etiologic diagnosis was established by laboratory methods in each case. We were interested in noting that usually two or three days after beginning terramycin treatment it was found that the white blood count had increased. Perhaps this may prove to be a valuable prognostic sign.

We believe this is the first report concerning therapy with terramycin by the intramuscular route.

CONCLUSION

Intramuscular terramycin affords a ready and dependable means for administration of this antibiotic when oral medication is not feasible. It also seems to serve as a satisfactory substitute for intravenous therapy when the latter appears indicated for meningitis, but hospital facilities are lacking.

REFERENCES

1. Hoyne, A. L.: Acute Purulent Meningitis. M. Clin. North America, 37: 329-344, March 1953.
2. Herrell, W. E.; Heilman, F. R.; Wellman, W. E. and Bartholomew, L. G.: Terramycin. Some Pharmacologic and Clinical Observations. Proc. Staff Meet. Mayo Clin., 25: 183, 1950.
3. Hoyne, A. L. and Riff, E. R.: Terramycin Therapy for Meningitis. A Report of Fourteen Recoveries without Other Medication. J. Pediat., 39:151-154, Aug. 1951.
4. Hoyne, A. L.: Intrathecal Therapy Contraindicated for Meningitis. Illinois M. J., 94, Nov. 1948.
5. Turner, G. G.: The Site for Intramuscular Injection. Brit. M. J., 2:56, 1944.
6. Glaser, J.: The Intramuscular Injection of Glucose. J.A.M.A., 91:722-726, Sept. 8, 1928.
7. Hoyne, A. L. and Brown, R. H.: 727 Meningococcic Cases. An Analysis. Ann. Int. Med., 28:248-259, Feb. 1948.
8. Hoyne, A. L. and Grossman, A.: Meningitis and Sulfathiazol. ARCH. PEDIAT., 62:241-247, June 1945.
9. Drake, M. E.; Bradley, J. E.; Imburg, J.; McCrumb Jr., F. R. and Woodward, T. E.: Aureomycin in the Treatment of Influenzal Meningitis. J.A.M.A., 142:963, Feb. 18, 1950.
10. Bryer, M.; Schoenbach, E.; Chandler, C.; Blass, E. and Long, P.: Aureomycin. Experimental and Clinical Investigations. J.A.M.A., 138:117, Sept. 11, 1948.
11. Smith, M. H. D.; Dormont, R. E. and Parther, G. W.: Subdural Effusions Complicating Bacterial Meningitis. Pediatrics, 7:34, 1951.

POLIOMYELITIS WITH SPECIAL REGARD TO TREATMENT OF ACUTE RESPIRATORY INSUFFIENCY. (Nordisk Medicin, Stockholm, 49:3, Jan. 2, 1953). In the period from late July to Dec. 1, 1952, 316 patients with respiratory paralysis and/or paralysis of pharynx and larynx were treated in the epidemic department of Blegdam Hospital, with sometimes as many as 70 patients at one time requiring artificial respiration. After Aug. 27 the standard treatment of stagnation of secretion in the upper respiratory tract and paralysis of the respiratory muscles was high tracheotomy, introduction of a rubber cuff-tube, frequent use of aspiration and bronchoscopy, postural drainage, and manual bag ventilation. Treatment along these lines, Lassen says, reduced the mortality from at least 80 per cent to about 40 per cent.—*Journal A.M.A.*

HYPOTHERMIA IN THE ETIOLOGY OF RETROLENTAL FIBROPLASIA

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Abnormally low body temperatures for prolonged periods of time in premature infants could be the basis of the pathological changes in the retinae resulting in retrolental fibroplasia. A review of the literature reveals that hypothermia has not been previously considered in the etiology and that the daily body temperatures of the premature infants with or without retrolental fibroplasia have been ignored in the papers written on this subject except as mentioned below.

Since 1942, when Terry[1] described this entity (for which Messenger suggested the name "retrolental fibroplasia,"[2]), there have been numerous different investigations as to the etiology, none of which has turned out to be correct. There have been several types of therapy, none of which has prevented or cured the disease. There have been many reviews of the literature, the most complete of which is by Zacharias[3] with a list of 219 references. Reese and Blodi[4a] have included in one of their papers colored plates of fundi in various stages of development of retrolental fibroplasia. In another paper, Reese and Blodi[4b] give the classification for the different active stages and the different cicatricial phases of retrolental fibroplasia. This is the classification that a committee submitted to the National Society for the Prevention of Blindness for standardization of the disease. It might be well to include this classification in this paper.

STAGES OF RETROLENTAL FIBROPLASIA IN THE ACTIVE PHASE

I. Dilatation and tortuosity of retinal vessels. Hemorrhages may or may not be present. Early neovascularization in the extreme periphery of the visible fundus may be present.

II. Stage I plus neovascularization and some peripheral retinal clouding. Hemorrhages are usually present. Vitreous clouding may or may not be present. Spontaneous regression may occur.

III. Stage II plus retinal detachment in the periphery of the fundus. Spontaneous regression unlikely.

IV. Hemispheric or circumferential retinal detachment eleva-

tion of the retina over a large area but still some with some retina in position.

V. Complete retinal detachment.

GRADES OF RETROLENTAL FIBROPLASIA IN CICATRICIAL PHASE

I. Small mass of opaque tissue in periphery of the fundus without visible retinal detachment. The fundus may have a pale appearance. The blood vessels may be attenuated.

II. Larger mass of opaque tissue in periphery of the fundus with some localized retinal detachment. The disk is distorted by traction toward the side of the tissue which is usually temporal. Cases ending in I and II have useful vision.

III. Larger mass of opaque tissue in the periphery incorporating a retinal fold which extends to the disk. Visual acuity varies from 5/200 to 20/50.

IV. Retrolental tissue covering part of pupillary area. Small area of attached retina may still be visible or only a red reflex over a sector of the fundus may be seen.

V. Retrolental tissue covering entire pupillary area. No fundus reflex present.

Krause[5] states the eyes seem normal at birth. The first internal ocular signs have been seen as early as the second week but are usually seen between the second and fifth postnatal months.

The acute or active phase lasts six months and is followed by regression and the cicatricial phase, the sequelae of which causes changes in the eye for several years thereafter.[4b]

As to the incidence, Reese and Blodi[4b] stated that 65 per cent of the premature infants weighing under three pounds and 30 per cent of those weighing 3-4 pounds have retrolental fibroplasia. Seventy-five per cent of these affected eyes undergo a spontaneous regression while the remaining 25 per cent progress to visual impairment and usually to blindness. McDonald[6] states that this disease is the greatest cause of blindness in the preschool child today.

The hyaloid artery does not close normally until about 4-6 weeks before full term development; prematurity could be an important factor in preventing its normal involution[1].

The retina has a higher rate of respiration than that of almost any other tissue.[7]

I	II	III	IV
Birth Weight	Birth Weight	Birth Weight	Birth Weight
1077 grams	1361 grams	800 grams	745 grams
Normal fundi	Retrolental	Retrolental	Retrolental
	Fibroplasia	Fibroplasia	Fibroplasia
			Regressed

DAILY TEMPERATURE RECORDINGS

Age	Age	Age	Age
1 Day - 92.4°(F)	7 Days - 92.6°(F)	2 Days - 92.° (F)	4 Days - 90.0°(F)
2 92.0-92.6	8 92.0-94.	3 91.0-92.4	5 90.0-91.8
3 90.0-93.6	9 94.0	4 92.0-92.8	6 91.0-92.2
4 92.0	10 94.0	5 91.0-95.2	7 90.0-92.2
5 92.0	11 94.2-91.8	6 90.0-91.8	8 90.0-92.0
6 92.0	12 94.0-95.0	7 91.6-93.0	9 90.0-93.0
7 92.0-92.4	13 94.0-94.6	8 92.4-93.0	10 91.0-92.6
8 92.0-92.4	14 94.2-95.2	9 93.0-94.0	11 90.4-92.4
9 92.0-92.4	15 94.6-96.6	10 95.0-96.0	12 91.0-92.2
10 90.2-92.4	16 95.6-95.6	11 95.0-95.8	13 90.0-91.0
11 90.6-92.4	17 94.2-95.4	12 95.0-95.8	14 90.0-91.8
12 91.6-92.0	18 94.6-97.2	13 95.8-96.8	15 90.0-91.4
13 90.2-93.0	19 95.0-96.8	14 95.0-96.0	16 90.6-92.0
14 91.4-92.6	20 93.8-96.6	15 94.6-95.2	17 92.6-93.8
15 91.8-93.0	21 93.6-95.4	16 94.6-96.0	18 91.0-92.8
16 93.4-95.0	22 93.8-96.0	17 94.0-95.8	20 91.6-92.0
17 93.4-94.	23 95.4-97.2	18 95.0-95.6	21 93.6-95.6
18 93.4-94.4	24 95.0-97.0	19 95.8-96.4	22 93.0-96.6
19 93.4-95.4	25 95.2-97.0	20 95.0-97.0	23 93.2-94.6
20 95.0-95.5	26 94.6-97.8	21 95.8-98.2	24 92.8-95.0
21 95.0-98.0	27 95.2-97.0	22 94.6-97.0	25 92.8-95.0
22 95.4-97.6	28 95.4-97.0	23 93.0-96.8	26 93.0-95.0
24 95.4-97.2	29 95.4-97.0	24 93.8-95.0	27 94.6-95.8
25 94.8-97.0	30 96.2-97.6	25 94.8-97.0	28 93.6-95.6
26 94.0-99.0	31 96.2-97.0	26 93.6-96.0	29 94.6-96.4
27 94.4-97.1	32 96.0-96.6	27 95.0-96.6	30 94.2-95.4
28 94.0-95.6	33 95.2-97.0	28 95.6-97.2	31 94.4-96.0
29 94.4-96.0	34 95.6-97.0	29 95.2-97.2	32 94.4-95.6
30 94.6-97.2	35 96.0-96.6	30 95.8-96.8	33 95.0-96.2
31 95.0-97.4	36 96.0-96.6	31 95.0-97.2	34 96.0-96.2
32 94.0-97.0	37 96.4-96.6	32 97.0-97.2	35 94.2-97.6
33 94.0-96.2	38 96.2-97.8	33 96.0-97.0	36 96.0-97.4
34 95.0-96.2	39 97.0-98.6	34 96.0-96.2	37 94.0-95.6
35 95.4-97.0	40 96.0-97.8	35 95.4-96.0	38 91.6-95.4
36 95.4-96.0	41 96.8-98.6	36 93.0-95.2	39 94.2-95.0
37 94.0-98.6	42 96.0-98.2	37 94.0-95.4	40 93.6-95.4
38 93.6-97.6	43 96.0-97.6	38 95.0-96.0	41 93.4-95.6
39 95.0-98.0	44 94.0-97.0	39 94.4-99.0	42 93.4-97.6
40 94.8-98.0	45 96.4-97.6	40 94.4-95.2	43 95.6-97.4
41 95.0-97.6	46 96.2-96.4	41 93.6-96.2	44 95.6-97.4
42 94.0-97.6	47 96.0	42 94.0-97.0	45 94.0-96.0
43 94.0-96.0	48 97.8	43 96.4-97.8	46 94.2-95.2
44 94.2-96.4	49 96.8	44 95.0-97.8	47 95.0-97.8
45 95.0-96.6	50 94.0-97.0	45 95.0-96.4	48 95.8-98.0
46 95.0-95.6	51 97.6	46 96.0-97.2	49 95.0-96.0
47 95.0-96.6	52 95.4	47 94.0-96.6	50 94.2-95.6
48 93.4-96.2	53 96.2	48 93.8-97.0	51 94.6-99.4

49	93.8-94.8	54	97.0	49	95.8-96.2	52	95.4-96.6
50	92.8-96.2	55	97.2	50	94.0-96.0	53	95.4-96.0
51	93.2-95.4	56	97.6	51	94.0-95.2	54	96.0-98.0
52	95.0-97.0	57	97.0-97.2	52	94.0-95.8	55	97.0-97.4
53	95.8-97.0	58	96.2	53	96.2-97.6	56	95.8-97.6
54	94.0-96.0	59	97.6	54	94.0-97.6	57	96.4-97.2
55	96.0-96.8	60	97.4	55	94.0-97.6	58	97.0
56	95.0-96.8	61	98.0	56	96.4-97.6	59	96.0-97.6
57	95.0-96.4	62	97.0-97.8	57	96.8-97.6	60	95.6-97.6
58	93.0-96.6	63	97.8-98.6	58	96.0-97.2	61	96.8-97.0
59	95.0-96.0	64	97.8	59	97.0-98.6	62	96.6-97.2
60	94.2-98.2	65	98.0	60	96.6-98.0	63	95.0-96.6
61	95.0-97.6	66	98.0	61	96.8-98.0	64	94.4-97.6
62		67	97.4	62	97.0-98.0	65	96.0-97.8
63		68	97.4	63	97.0-98.0	67	96.6-97.4
64	97.0	69	98.0	64	97.2-98.2	68	95.8-97.0
65	97.0	70	97.8	65	94.0-97.2	69	94.6-97.0
66	96.5	71	97.6	66	97.6-98.8	70	96.0-97.6
67	98.0	72	97.2	67	97.0-97.8	71	95.4-97.8
68	96.4	73	98.0	68	97.0-98.8	72	97.0-97.8
69	97.0	74	98.6	70	96.0-97.0	73	97.0
70	97.0	75	98.6	71	95.4-96.8	74	96.2
71	97.0	76	98.6	72	96.0-97.6	75	98.0
72	98.0	77	97.8	73	96.2-98.0	76	97.0
73	97.8	78	97.6	74	97.0-97.6	77	97.2
74	97.0	79	96.6	75	96.6-98.0	78	97.2
75	97.6	80	97.0	76	97.8-98.4	79	97.4
76	97.6	81	97.0	77	96.8-97.6	80	97.8
77	97.4	82	97.8	78	97.8-98.0	81	96.2
78	96.0	83	96.2	79	98.0-98.6	82	96.6
79	97.0	84	97.6	80	98.0	83	96.2
80	97.4	85	97.0	81	97.2-98.0	84	98.0
81	96.0	86	97.0	82	97.6-97.8	85	97.6
82	97.8	87	97.0	83	98.0-98.2	86	97.6
83	98.2			84	97.6-98.0	87	98.2
84	98.0			85	97.6		
85	97.6			86	97.2		
86	97.6			87	97.4-98.0		
87	100.2-98.0			88	98.0		
88	97.0			89	98.0		
89	96.4			90	98.2		
90	97.6			91	98.0		
91	97.2			92	98.0-98.6		
92	98.0			93	98.0-98.6		
93	98.2			94	98.0-98.6		
94	97.8			95	98.0-98.6		
95	98.6			96	98.0-98.6		
96	98.0			97	98.0-98.6		
97	97.0			98	98.0-98.6		
98	97.8			99	98.0-98.6		
99	97.6						
100	97.0						
101	98.0						
102	98.0						
103	97.6						
104	97.2						
105	98.0						

Clark and Clark[8] cite demonstrations that after removal of the heart in the embryo, or after inhibition of the heart by chemicals, or after removal from the body to artificial media, new capillaries send out sprouts which anastamose to form plexuses in the absence of circulation.

Szewczyk[9] is of the opinion that retrolental fibroplasia is due simply to subclinical anoxia during a period of time when the incompletely developed retina utilizes oxygen at a rapid rate. The vascular engorgement which develops initially in this disease is a compensatory mechanism. If the need of oxygen by the retina is met partially or completely by the diluted vascular channels, the disease develops either in its attenuated form or not at all. His explanation of the mechanism of the disease is that when the oxygen tension in the blood falls below the requirements of the fetal retina the retinal vessels dilate, then become tortuous, and at the same time new channels develop. If the demands for oxygen are still not satisfied, edema in the most fetal parts of the retina develop (peripheral gray white areas), the vessel walls begin to suffer, especially on the venous side, because the retina uses all the available oxygen and transudation and hemorrhages take place.

In some hospitals it is the current pediatric practice to allow the prematures' temperature to become stabilized with the incubator temperature being 88°-92° F. In the premature infants below three pounds, this stabilized temperature is a great many times as low as 90°-92° F. (rectal or axillary) for as long as the first 14-20 days of life. It has been my observation that the body temperature for some of these small prematures is abnormally low for a prolonged period of time.

The following temperature recordings are of four premature infants. One whose fundi were normal; three who developed retrolental fibroplasia; one of which regressed.[10] (See pp. 328-9).

In contrast to the above temperature recordings Exline and Harrington[11] reported on the follow-up of eighty cases of premature infants who weighed less than 1500 gms. (3 pounds 5 ounces) which were examined at seven months of age for evidence of retrolental fibroplasia. The group covered a time period of two years ending December 31, 1949. No cases of retrolental fibroplasia were found. In this series the temperature of forty-three infants had daily variations in axillary temperatures not exceed-

ing 2° F.; thirty-seven infants had variations of more than 2° F., especially in the early period of adjustment. Temperatures were stabilized in the second week of life at levels below 97° F. in three infants, at 97°-99° F. in fifty-five infants and at above 99° F. in twenty-two infants.

If it is the policy of some of the hospitals to try to maintain a normal body temperature in the premature infants then this might be the basis for the geographic variation in the incidence of the disease as is often reported.

These two reports of temperature recordings appear to be significant in their relation to the development of retrolental fibroplasia.

It seems logical that the lowered body temperature would cause a reduced metabolic uptake of oxygen resulting in an anoxia to the retina at a critical growth period. Because of the anoxia, the above mentioned sprouting of the capillaries occurs (the "neovascularization" of Reese et al.[12], the "angioplastic process" of Tyner[13], "channeling" of Szewczyk[7]), thus initiating the active phase of retrolental fibroplasia. Krause[14] mentions that if the disease is postnatal it is possible that it is related to pediatric management, occurring more frequently in infants born in hospitals with better pediatric management. He also mentions the occurrence of edema in the premature which appears after the thirtieth day of life. When the edema is generalized, it must affect the hydrostatic oncotic pressure relationships of the eyes as well as of the rest of the body. It is easily seen that with anoxia, acidosis and edema the capillaries tend to leak fluid, serum and blood in the inner eye and give rise to the mechanism of fibroplasia.

The infant in utero is heated by conduction by the cord blood and by the amniotic fluid. In the makeshift incubators the premature infant is heated by conduction or radiation from hot water bottles or electric light bulbs. This may be the reason for the lower incidence of retrolental fibroplasia in the hospitals where the pediatric management is not of such high standards as is inferred above[11]. In most incubators the premature is kept warm by convection, and this type of heat does not seem to penetrate deep into the body tissues. It seems logical that it would be better to supplement this type with a radiation or conduction type of heat.

CONCLUSION

1. Hypothermia in the premature infant could be the basis of the anoxia of the retina which initiates the active phase of retrolental fibroplasia.

2. Regulated conduction, or radiant heat, should be used with the present convection type heated incubator in attaining and maintaining the normal body temperature of the small premature infant.

REFERENCES

1. Terry, T. L.: Fibroplastic Overgrowth of Persistent Tunica Vasculosa Lentis in Premature Infants. Am. J. Ophth., 25:203, Feb. 1942.
2. Terry, T. L.: Fibroplastic Overgrowth of Persistent Tunica Vasculosa Lentis in Infants Born Prematurely. Tr. Am. Ophth. Soc., 40:262, 1942.
3. Zacharias, L.: Retrolental Fibroplasia. A Survey. Am. J. Ophth., 35:1426-1454, Oct. 1952.
4. (a) Reese, A. B. and Blodi, F. C.: Retrolental Fibroplasia Symposium. Am. J. Ophth., 1-24, Jan. 1951.
   (b) Reese, A. B. and Blodi, F. C.: Retrolental Fibroplasia Symposium. New York State J. Med., 52:2869-2874, Dec. 1952.
5. Krause, A. C.: Blindness in Premature Infants with Special Reference to Retrolental Fibroplasia. Texas Rep. Biol. & Med., 9:46-58, Spring 1951.
6. McDonald, P. R.: Retrolental Fibroplasia. M. Clin. North America, 36:1579-1585, Nov. 1952.
7. Krause, A. C.: Metabolism of the Retina. Arch. Ophth., 36:328, Sept. 1946.
8. Clark, E. R. and Clark, E. L.: Microscopic Observations on Growth of Blood Capillaries in Living Mammal. Am. J. Anat., 64:251-301, March 1939.
9. Szewczyk, T. S.: Retrolental Fibroplasia, Etiology and Prophylaxis. A Preliminary Report. Am. J. Ophth., 34:1649-1650, Dec. 1951.
10. From Personal Communication with Dr. Lula Lubchenco, M.D., University of Colorado, Dept. of Medicine, Denver, Colo., April 1953.
11. Exline, A. L., Jr. and Harrington, M. R.: Retrolental Fibroplasia; Clinical Statistics from the Premature Center of Charity Hospital of Louisiana at New Orleans. J. Pediat., 38:1-7, Jan. 1951.
12. Reese, A. B.; Blodi, F. C. and Locke, J. C.: The Pathology of Early Retrolental Fibroplasia with an Analysis of the Histologic Finding in the Eyes of the Newborn and Stillborn Infants. Am. J. Ophth., 35:1407-1426, Oct. 1952.
13. Tyner, G. S. and Frayer, W. C.: Clinical and Autopsy Findings in Early Retrolental Fibroplasia. Arch. Ophth., 46:647-654, Dec. 1951.
14. Krause, A. C.: Etiology of Retrolental Fibroplasia. Am. J. Ophth., 34:1003-1006, July 1951.

ERYTHROCYTE SEDIMENTATION RATE IN TUBERCULOUS MENINGITIS. (Minerva Pediatrica, Turin, 4:343, May 15, 1952). The erythrocyte sedimentation rate was determined for 81 children with tuberculous meningitis during streptomycin therapy. The reactions of the 48 children who died and of the 33 who recovered or in whom there was an improvement were studied separately. The patients were also grouped according to the various tuberculous localizations associated with meningitis. The values of the first and last tests are given for each patient. Since there was never a relationship between the erythrocyte sedimentation rate and the course of the disease, the condition of the spinal fluid, and the other localizations involved, this test has no prognostic value during streptomycin therapy of tuberculous meningitis with or without pulmonary involvement.—*Journal A.M.A.*

THE Q-T INTERVAL IN RHEUMATIC FEVER*

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In the electrocardiogram the Q wave is generally believed to represent the beginning of depolarisation of the ventricular muscle, while the end of the T wave marks the completion of repolarisation. The Q-T interval therefore indicates the time from the beginning of invasion of the ventricles by the impulse to the time of complete return of all parts of the ventricles to the resting polarized state.

The length of the Q-T interval varies with the heart rate, being longer at slow rates and shorter at fast rates. Various attempts have been made to reduce the Q-T interval to a more or less abstract and constant figure by making corrections for changes in heart rate and other variables. Some of these attempts were discussed by Ashman[1], Robb, Bazett[2], Fridericia, Goldberger[3], and others. Perhaps one of the best is Goldberger's nomogram[4], and it was the one chosen to relate the measured Q-T interval to the heart rate in this work.

There are various factors which affect the length of the Q-T interval. It is prolonged in hypocalcaemia and hypokalaemia and also by quinidine administration. It may also be prolonged in the presence of ventricular hypertrophy and in congestive heart failure. It has been found to be frequently prolonged in cases in which necropsy findings showed myocarditis of non-rheumatic origin. Shortening of the Q-T interval has been reported in cases of pericarditis with effusion both of rheumatic and tuberculous aetiology. It is interesting to note that digitalis and calcium—both of which increase the efficiency of the heart—produce shortening of the Q-T interval.

It would seem that it is not heart disease, per se, that causes prolongation of the Q-T interval, but some other condition, often but not always, associated with heart disease. Myocardial ischemia

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and disturbances of the acid base balance may be examples of such a condition. While a prolonged Q-T interval may give indication of the degree to which the myocardium is affected, it is evident that it cannot be taken as a proof of irreparable damage of the heart muscle.

The Q-T interval was found to be prolonged in cases of active rheumatic carditis by various observers, and the suggestion was offered that such prolongation may be used as an index of the presence of activity of the process.

MATERIAL

Forty electrocardiograms of thirty-eight children, whose ages ranged from 2 years 9 months to 12 years, were analysed. They were divided into two groups:

The first group (group I) was composed of 28 patients for whom 30 electrocardiograms were done. All of them had definite evidence of active rheumatic infection.

The second group (group II), composed of 10 normal patients, was taken as controls.

All the recordings were made with the child in the supine position. The apparatus used in all the cases was the Siemens' string electrocardiographic machine. All the measurements were taken from the lead II. The Q-T and R-R intervals of six cardiac cycles were measured for each patient, and the average Q-T estimated, using, as already mentioned, Goldberger's nomogram.

RESULTS

The Q-T ratios for the two groups are presented in Table I.

From Table 1, it will be seen that in children suffering from active rheumatic carditis (group I), the Q-T ratio showed a wide scatter. In 10 cases (one-third) it varied between 1.32 and 1.09. It measured 1.32 in a single case and 1.26 in another; in the majority (8 cases) it ranged between 1.18 and 1.09. In cases (more than a third), the Q-T ratio varied from 1.06 to 1.03; in 4 children it was 1.06 and in another 3 children it measured 1.04. The remainder (9 cases) showed a Q-T ratio varying from 1.00 to 0.85. In all the children of the control group (group II) the Q-T ratio varied from 1.06 to 0.91.

TABLE I

Q-T ratio	*Group I*	*Group II*
1.24		
1.25		
1.32	*	
1.31		
1.30		
1.29		
1.28		
1.27		
1.26	*	
1.23		
1.22		
1.21		
1.20		
1.19		
1.18	*	
1.17	*	
1.16		
1.15		
1.14		
1.13		
1.12	* * *	
1.11	*	
1.10	*	
1.09	*	
1.08	.....	..... (a)
1.07		
1.06	* * * *	* ..... (b)
1.05	* *	
1.04	* * *	*
1.03	* *	
1.02		
1.01	.....	* ..... (c)
1.00	+ + + * + + + + + + + + + +	* + + + + + + + + + + + + + + (d)
0.99		
0.98	*	*
0.97	*	*
0.96		*
0.95		
0.94		*
0.93	*	
0.92	* * *	
0.91		*
0.90		
0.89	*	
0.88		
0.87		
0.86		
0.85	*	

(a) = Goldberger's figure.
(b) = Ashman & Hull's figure.
(c) = Taran's figure.
(d) = Average normal.

DISCUSSION

The Q-T interval was noticed to be prolonged in patients suffering from rheumatic carditis, by Berliner[5], Ashman[1] and others. These observations were not considered to be of value for the diagnosis of cardiac involvement during an attack of acute rheumatic fever until Taran and Szilagyi[6,7] claimed that the duration of electrical systole was lengthened in all the children whose electrocardiograms had been taken during an attack of acute rheumatic carditis. But although such a prolongation was reported by many authors, the incidence of such a finding varied widely. Abrahams[8] found a prolonged Q-T interval in 90 per cent of his patients with active carditis. On the other hand, Goldberger found prolongation of the Q-T interval in only 28 per cent of his patients with active rheumatic fever, and Briggs and Doxiadis[9] found this prolongation in only 11.8 per cent of cases.

Several possible factors have been suggested to explain such divergent views (Finkel and Baldwin[10]). The type of electrocardiographic instrument employed and the difficulty of accurate measurement of the Q-T interval in certain records, as well as individual differences in methods of measurement among observers, may possibly account for the differences in the reported incidence. The inclusion of cases associated with pericarditis with effusion or complicated by congestive heart failure and under digitalis treatment or occurring on a previously damaged heart with ventricular hyperthrophy would influence the results. More significant, however, is the figure chosen to represent the upper limit of normal Q-T ratio for children. Taran[6], in his series, considered this figure 1.01, while Ashman and Hull[1] considered it 1.06. Later, Goldberger[4] placed the figure as high as 1.08. Taking Goldberger's figure as the upper limit of normal Q-T ratio, we find that among the 30 cases of group I, 10 cases gave values higher than 1.08 (33.3 per cent), while all the control cases (group II) were below that figure. If we take Taran's figure of 1.01 as the upper limit of normal, we find that 21 cases of group I gave higher values (70 per cent), while two cases of the control group gave similar high values (20 per cent). Perhaps Goldberger's figure is safer because no one of the control cases exceeded it.

SUMMARY AND CONCLUSIONS

The value and limitations of the length of the Q-T interval in rheumatic carditis is discussed.

The Q-T interval was examined in 30 electrocardiograms during the active stage of rheumatic carditis. Ten normal children were studied as controls.

Taking Goldberger's figure as the upper limit of the normal, 33.3 per cent of children suffering from active rheumatic carditis showed a prolonged Q-T interval; none of the controls showed such prolongation.

It is evident that while a prolonged Q-T interval may be found during the active stage of the disease, such a finding is neither constant nor frequent. A normal measurement does not invalidate the diagnosis of active carditis.

REFERENCES

1. Ashman, R. and Hull, E.: Essentials of Electrocardiography, 1937.
2. Bazett, H. C.: Analysis of Time Relations of Electrocardiograms. Heart 7:353, 1920.
3. Goldberger, E.: A Simple Method of Measuring Abnormalities of the Q-T Interval. Am. Heart J., 36: 142, 1948.
4. Goldberger, E.: Heart Disease, 1951.
5. Berliner, K.: Am. Heart J., 7: 189, 1931.
6. Taran, L. M. and Szilagyi, N.: Am. Heart J., 33: 14, 1947.
7. Taran, L. M. and Szilagyi, N.: Brit. Heart J., 13: 10, 1951.
8. Abrahams, D. G.: Brit. Heart J., 11: 342, 1949.
9. Briggs, J. N. and Doxiadis, S. A.: The Q-T Interval in Rheumatic Fever. Arch. Dis. Childhood, 26: 311, Aug. 1951.
10. Finkel, S. and Baldwin, J.: Pediatrics, 9: 410, 1952.

CORTICOTROPIN AND CORTISONE IN LEUKEMIA IN CHILDREN. (Canadian Medical Association Journal, Montreal, 65: 560, Dec. 1951). In all, 37 children with leukemia were treated with corticotropin (ACTH) and/or cortisone. There were 20 boys and 17 girls from 15 months to 14 years of age. In all cases the history and clinical condition at the time of first admission indicated that the expected survival time without treatment would have been less than one year. Periods of treatment that resulted in complete remission varied from 15 to 35 days. Temporary remissions occurred in approximately 50 per cent of the patients, but none could be considered as cured or permanently benefited. Although repeated remissions were obtained in a few children, all eventually became refractory to further hormone therapy. The authors feel that corticotropin and cortisone, although unsatisfactory for the permanent treatment of leukemia in children are valuable in the further investigation of this disease.—*Journal A.M.A.*

PEDIATRICS AT THE TURN OF THE CENTURY

From time to time the Archives, which was the first Children's Journal in the English language, will reprint contributions by the pioneers of the specialty over fifty years ago. It is believed that our readers will be interested in reviewing such early pediatric thought.

HYPERTROPHIC PYLORIC STENOSIS IN AN INFANT TEN WEEKS OLD.*

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In 1788 an article on "Hypertrophic Pylori Stenosis," by Hezekiah Beardsley, appeared in the earliest volume of medical transactions issued in this country, entitled "Cases and Observations by the Medical Society of New Haven County in the State of Connecticut," New Haven, J. Meigs, 1788. This article was republished by Osler in the ARCHIVES OF PEDIATRICS, May 1903. It is the first authentic case on record.

We are indebted to Hirschprung for a careful description of this disease in the year 1887. Many observers, such as Williamson in 1841, and Dawosky in 1842, and the anatomical studies of Landerer in 1879, and Rudolf Maier in 1885, describe pyloric stenosis in adults, the youngest cases being twelve and sixteen years respectively. Although some of these authors believe that this condition was congenital, none report infantile cases.

Finkelstein reported 14 cases in 1899. Cases are reported by Henschel, Freund, Ashby, Köppen, Ibrahim and Schotten. Henschel reports an increased gastric capacity, namely, 400 ccm in one case observed by him.

Knöpfelmacher reported a case of persistent vomiting associated with hyperchlorhydria. In his case the symptoms greatly resembled that of pyloric obstruction. An excess of hydrochloric acid was demonstrated by him in the gastric contents, for the relief of which he ordered whole milk, on the theory that the casein would help to neutralize the excess of acid.

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Schmidt cites Nicoll's case of a child which suffered with persistent vomiting, for the relief of which the pylorus was resected about the sixth week. One interesting point learned from Nicoll's and similarly from Still's case, is that these infants appear to be normal at birth, take their nourishment and retain the same. They also develop, as evidenced by the increased in weight, and this condition is precisely that which existed in my own case under discussion this evening.

Ibrahim, in a recent monograph on congenital pyloric stenosis in nurslings, reports a series of 7 cases observed by him at the Clinic of Vierordt, in Heidelberg. In this interesting series there is one case in which active gastric symptoms of vomiting occurred immediately after every form of feeding. Visible peristaltic waves were marked evidences of this condition, which proved to be pyloric stenosis postmortem.

In an elaborate paper published by Meinhard Schmidt (Arch. für Klinische Chirurgie, 1901, Band XIII., p. 976), there is described a series of successful gastroenterostomies performed by Kehr and Löbker. These cases pertain to infants that were evidently doomed to die of inanition due to persistent vomiting of food. Schmidt calls this condition "hyperemesis lactentium." He describes a series of successes with Loreta's operation, consisting of laparotomy, incising the stomach and mechanical dilatation of the narrow pylorus.

Interesting observations and anatomical studies are also recorded by Pfaundler, who believes that a perfectly normal stomach will sometimes show a contracted pylorus, so that it may resemble in its appearance a ring-like tumor. Pfaundler terms these cases "functional systolic stomach" as against the relaxed or diastolic stomach. I do not agree with Pfaundler, because a pylorus containing an overgrowth and hypertrophy of the muscular fibres due to overaction of the pylorus is a different condition from one in which a systolic (contracted) stomach exists; the latter condition is chiefly pyloric spasm.

Heubner and his associates, Gran and Finkelsetin, in 1896 reported a series of observations based on anatomical findings and they are inclined to the belief that pyloric spasm is the typical condition which produces the stenosis resulting in the usual train of symptoms.

J. H. Nicoll reports the case of a baby, six weeks old, that

vomited after the second week. This condition continued and from persistent vomiting the infant emaciated. Loreta's operation was performed and the child was in good health one year later.

In our country very few authentic cases have been reported, although there are 66 cases recorded in the world's literature. As all of these cases were autopsied there is no question about the diagnosis.

Meltzer in 1898 found a record of 4 cases in this country, 2 of which were described by Ashby of Manchester, England. Of 22 cases of congenial stenosis found at autopsy in infants, the diagnosis was correctly made *intra vitam* in but 4.

Stenosis of the pylorus in infants is not so rare a condition as is commonly supposed. In 1902, a bibliography of 109 cases was reported by Cautley and Dent. Up to the present date about 150 cases have been reported.

Literature records many cases since Meltzer's publication in our country. So I have found Pritchard's case in 1900, Saunder's in 1902, West's in 1903 and Dorning's in 1904. The latter cases are authentic as they were operated and the specimen removed, or the postmortem proved the correctness of the diagnosis.

Anatomical and Physiological Peculiarities of the Stomach. "The stomach has only slight powers of absorption or assimilation, and is more a motor than a digestive organ. The muscular tissue is made up of three sets of fibres, all of which extend to the pylorus. The stomach proper has also a secretory function, but the work of the pylorus is chiefly motor.

"The circular set of muscular fibres are greatly increased at the pyloric orifice, forming what is called the sphincter pylori. The cardiac end has no special sphincter, and gas and liquids can readily pass through it during digestion. The mucous membrane at the pylorus is thicker and forms a fold known as the pyloric valve. There are traces at the pars pylori of a second gastric chamber in the bulging called the antrum pylori. The gastric cells and tubules in the neighborhood of the pylorus differ in construction and function from those located elsewhere in the stomach.

"The pyloric region is essentially one of considerable structural variability. The pneumograstric nerves supply both motor and sensory filaments. Bechterew has shown that by irritating one branch of the pneumogastric, without interfering with the others,

the cardiac end of the stomach will dilate, while the stomach and the pylorus remain contracted. This proves that each portion of the stomach has its special nerve filament. The splanchnic nerves connect the stomach with the sympathetic nervous system. The pylorus has the power within itself of contraction or dilation, and the contraction is always increased by the ingestion of food.

"A stenosis of the pylorus may occur, according to some authors, as a congenital malformation. The circular muscular fibres are excessively developed, producing a violent contraction of the sphincter with the resulting retention and subsequent vomiting. In other words, the claim is made that this is a primary condition where Nature, in her extreme anxiety to provide an efficient pyloric sphincter, has overexerted herself, and has produced too great a quantity of muscular tissue."

A point to remember is normally the pylorus presents considerable difference in regard to the thickness of the circular muscular layer, and this quite apart from states of contraction.

Theories of the Pyloric Stenosis. Many theories have been propounded from time to time regarding the cause of this condition.

In searching through the literature I find that Still in the British Medical Journal reports 3 cases of plyoric stenosis, one of which was identical with mine, inasmuch as the violent symptoms such as vomiting began during the sixth week. This infant died during the fifteenth week. In the second case vomiting began during the third week; the pylorus was palpable and the peristalsis of the stomach visible. In the third case vomiting began during the fifteenth week and the pylorus was felt as a tumor through the abdominal wall.

Still believes it is most likely due to spasm arising from disturbances in the nervous co-ordination. It is believed by others to be due to developmental hyperplasia of the pyloric muscle, but neither hypothesis can be substantiated.

Carle and Fantino (Centralblatt für Schweizer Aerzte) discuss the diagnosis of pyloric stenosis and believe that hyperacidity is responsible for spasm of the pylorus, namely, in the closure of the pylorus during the production of hydrochloric acid. In the greater number of cases the spasm is primary but it is undoubtedly increased by hyperacidity.

Meltzer says: "It seems to me that, by accepting the congeni-

tal muscular hypertrophy of the pylorus, not as a secondary occurrence due to some overaction, but as a primary lesion, simply as an embryological malformation, we make a much less risky hypothesis than that made by Thomson, which assumes, without safe precedent, an embryological disorder in the nervous mechanism of the pylorus, of which we know so little in the fully grown animal. And, after all, it is not simply a hypertrophy of the muscular tissue; it is the hypertrophy of all the tissues of the pyloric valve—it is, so to say, the hypertrophy of an organ. The pyloric valve has variable dimensions in different individuals, and it might occur that in one or the other individual it attained such a size as to be pathological in a teleological sense. The structure of the hypertrophied pylorus reminds one very much of the normal structure of the ileocecal valve, in which, too, the longitudinal muscularis does not participate in the formation of the fold. In this connection it is worthy of mention that Brandt described a case in which there was a hypertrophic stenosis of the pylorus as well as of the valve."

The following case will illustrate a typical hypertrophic stenosis of the pylorus in which the active symptoms began when the baby was six weeks old.

Harold B., male infant, born October 18, 1905, was first seen by me December 31, 1905, when ten weeks old. He was the second child born to this family.

Family History. Father and mother are in good health and there is no family disease on either parental side. One other child in this family is three years old and in good health. The mother has had no miscarriages.

Infant's History. At birth the infant's weight was 8½ pounds. He was well developed and nursed vigorously. Facial paralysis was noticed soon after birth but no other abnormality. He was nursed by his own mother and digestion progressed normally. The bowels moved twice a day, the stool was yellowish and well digested. The infant gained in weight and slept four and five hours at a time. When six weeks old he suddenly commenced vomiting. The vomiting was noticed after each nursing. Associated with the same there was no gain in weight, although the vomiting frequently occurred several hours after feeding. Medical advice was sought for the continued vomiting. The quantity

vomited ranged between one and two ounces and sometimes as much as eight ounces. Owing to the continued vomiting a physician ordered weaning. A wet nurse was ordered. Vomiting persisted as much with the wet nurse as formerly with the mother. After one week's trial the wet nurse was discharged and then various home modifications were ordered. No improvement was noted.

I first saw this case on December 31st when the patient was two and one-half months old. He was extremely emaciated, the skin had lost its normal elasticity and there was a very thin layer of panniculus adiposus. The weight was 7½ pounds, which is 1 pound less than the body weight at birth. There was a slight squamous eczema of the scalp and the patient resembled that type of marasmus seen in mid-summer after an exhaustive cholera infantum. The temperature taken in the rectum ranged between 97° and 98⅖° F., never higher. The pulse-rate was 96, small, thready and irregular, although rarely intermittent.

Physical Examination. Nothing abnormal in the lungs was made out. Percussion and auscultation were normal. In the heart a loud systolic murmur was heard at the apex of the heart and also in the carotid. This was associated by me with the general anemia and underfed condition as an anemic murmur. The spleen could be palpated with difficulty by pushing the fingers well up under the ribs. The liver extended from a point corresponding with the nipple on the right side to 6 cm. below the free border of the ribs. The stomach sometimes appeared like a distended balloon, while at other times it appeared flat. On percussion a tympanitic note was obtainable. There was also a splashing sound very distinctly heard when the stomach was palpated. When food was given the baby, very strong peristaltic waves could be noticed from left to right. There was a distinct hourglass contraction, the stomach bulging on either side with a sulcus in the middle. These active peristaltic and antiperistaltic waves were at times so strong that the stomach appeared like the double bulb seen on an atomizer. These active peristaltic waves were usually followed by vomiting.

Following the method of Boas, a soft flexible catheter was introduced into the stomach. It could be felt bent around the large curvature corresponding with the lower border line of the

stomach. The anatomical outline was mapped out by me several times. The stomach was washed (lavaged) with warm saline solution for a number of days. I found that although the infant was but ten weeks old, the capacity of the stomach was about fourteen ounces. This proved that not only was this infant suffering with what I diagnosed as pyloric stenosis but also with an acute dilatation of the stomach. The siphoning of the gastric contents was effected several times, once two hours after feeding to determine the sufficiency or insufficiency of the stomach, and I found a marked insufficiency in this case. This in itself is an important factor in determining the diagnosis, as the stagnation of food residue is usually found.

Vomiting. The vomiting was regurgitant, at times, however, markedly explosive. The quantity vomited ranged from a teaspoonful to many ounces. At no time was bile mixed with the vomit. Large strings of mucus of a glairy character were sometimes present. Early in the disease vomiting was occasional but as the symptoms progressed vomiting followed the swallowing of any liquid. As a rule the vomit had a very sour smell, resembling butyric acid, and occasionally consisted of cheesy curds, mixed with a large amount of liquid. There was also regurgitation of small quantities of liquid. The trained nurse in charge counted twenty-seven large and small vomiting attacks in twenty-four hours. In this case there was no foul odor to any portion of the vomit. An examination of the gastric contents showed the presence of lactic acid (Uffelmann's reagent), and a total absence of hydrochloric acid with Gunzburg's reagent.

Stools. The condition of the bowels was decidedly characteristic. Small greenish masses were sometimes passed and also occasionally meconium type of stool. Milk feces in which curds or yellowish particles would be expected was invariably absent. Two or three days would pass without the slightest evidence of feces having been passed and still I cannot describe the absence of stool as due to constipation, but rather to the absence of food passed through the pylorus.

Prognosis. The prognosis in this case was very bad. No food was retained owing to the constant vomiting and the infant lost steadily from week to week. At two and one-half months the infant weighed about two pounds less than it did at birth. Surgical treatment was the only relief plausible after all other therapeutic

measures were tried, and while very little hope was entertained on account of the feeble resistance and subnormal vitality we decided to operate.

Treatment. The stomach was washed with several pints of warm saline solution every morning. This was followed by rest. Then a weak food consisting of fat 1 per cents sugar, 5 per cent, proteid 0.5 per cent; of this one ounce was ordered every three hours. As vomiting continued I ordered smaller meals, one-half ounce of food of the above strength, every two hours. As the vomiting still persisted, I stopped all stomach feeding for twenty-four hours and tried rectal alimentation. This was done to give the stomach absolute rest. When stomach feeding was again tried I ordered whey in one ounce feedings every two hours. The symptom of vomiting associated with visible peristaltic waves soon reappeared and again the condition was as bad as before the stomach rest was ordered.

The Urine. The urine was very scanty, owing to the small amount of liquid and food being taken. At times a whole day would pass without a single diaper being wet. It was impossible to collect the urine for a chemical examination.

Tumor Palpable. On palpating the pylorus a small resisting mass about the size of an adult thumb could be felt, as a hard nut. This mass was felt in the epigastrium.

Diagnosis. Visible peristaltic and active antiperistaltic waves, hour-glass contraction at times. Vomit: Persistent vomiting of small quantities though at times very large quantities of the food were taken. While but two ounces was fed at a meal the infant vomited six ounces, showing the retention of several meals within the stomach. There was an absence of bile in the vomit. Stool: Small in quantity, greenish in color, resembling spinach, consisting chiefly of mucus. Tumor: There was a palpable tumor the size of a walnut in the epigastrium. Constant emaciation from inanition.

Based on the above named symptoms my diagnosis was hypertrophic pyloric stenosis.

Medicinal Treatment. Antispasmodics such as belladonna, sodium bromid and codein were prescribed by mouth as well as per rectum without any amelioration of the symptoms.

Locally—Externally. An ice bag was tried, also an ether spray and ethyl chlorid over the epigastrium, but with no result.

I then recommended surgical relief, the report of which my colleague, Dr. Sturmdorf, will give.

Surgical Report of Gastroenterostomy by Arnold Sturmdorf, M.D. On January 17th of this year, I was requested by Dr. L. Fischer to perform an immediate operation for the relief of a congenital hypertrophic stenosis of the pylorus in the case here reported.

At the time of operation the extremely emaciated, atrophic infant presented a weak but distinctly perceptible pulse of about 120. The dilated stomach, in active antiperistalsis, showed plainly through the attenuated, lax epigastrium in which the outlines of the tumefied pylorus could be distinctly palpated.

The stomach and intestines having been thoroughly irrigated under Dr. Fischer's supervision, the usual preoperative preparation of the patient was carried out as thoroughly as the modest surroundings permitted.

Omitting technical minutiæ, it will suffice to state that through an inch and a half incision, carried slightly to the right of the mid-epigastric line, the hypertrophied pylorus was drawn forward, just sufficient to bring duodenum and the pyloric end of the greater curvature of the stomach into easy apposition, somewhat in the manner of the first step in the Finney operation.

The contiguous parts were rapidly anastomosed by double tier sutures and the abdomen closed.

The time consumed in actual operative work was twenty-two minutes; the narcosis, which was most judiciously supervised by Dr. Fischer, had to be interrupted repeatedly, owing to the condition of the child; this, added to a lack of facilities essential for rapid work, caused anxious and annoying delays.

The postoperative data, as well as a description of the specimen, are embodied in Dr. Fischer's report.

The surgeon who approaches a case of this nature with confidence based upon experience in the adult form of pyloric obstruction is destined to find himself inadequately equipped. Nor will he find the wherewith to fill the gaps in his knowledge of the condition among the one hundred and twenty-three existing articles on the subject; for, while congenital hypertrophic stenosis of the pylorus is a recognized clinical entity, the extreme paucity of individual experience, and the lack of precision in conception and detail which characterizes the published summarized observa-

tions on the condition, leave its current literature almost barren of guiding or elucidating precedents.

As to the cause and nature of this malady, all is conjecture; a few possible and many impossible hypotheses are in vogue.

A critical review of the subject, however, brings out certain points of interest and importance. Thus, the authentically recorded cases will be found to present a striking clinical similarity, especially in the development of characterizing symptoms at about the fourth week of infantile life, occasionally later, but in no well observed case earlier. In addition to this, it may prove of significance, that although the condition is accepted and termed *congenital,* reliable investigators have been unable to demonstrate its existence or what might be interpretvd as precursors of its existence immediately before or at birth.

It would seem obvious that a congenitally constricted pylorus should manifest itself in some degree at least, as soon as its function is called into play; in other words, some clinical evidence of the existence of a barrier to the normal egress of food from the stomach should present itself after the first natural feeding.

It will appear from what follows that these two factors, namely, the existence of a quiescent interval between the birth of the child and the development of obstructive symptoms on the one hand and the absence of fetal evidences of the condition on the other hand, present a significant bearing on the therapeutic aspects of this malady.

Let us recall that under normal conditions the circular muscle fibres of the pylorus at birth are relatively augmented, gradually approaching the normal as the long axis of the stomach assumes its horizontal direction from the vertical; this relative augmentation of the circular fibres is intended to prevent the too rapid emptying of the vertical tubular infantile stomach during the first two weeks of life. These fibres, stimulated to excessive function by any given cause, must according to recognized physiological principles become hypertrophied.

Augmented muscle calls for augmented nutritional conditions; add to this factor the active developmental stimuli prevailing at this period of life and it becomes an easy matter to conceive of the production of such an overgrowth of tissue as these specimens present.

Clinical and pathological evidence apparently sustain this the-

oretical view of the development of this condition; at all events, this view offers a reasonable therapeutic working basis by attributing the tissue overgrowth with its consequences to familiar factors; at the same time it offers an explanation of apparent incongruities existing between the imputed results of certain surgical procedures and the pathological conditions as depicted in the present specimen.

Accepting such a working basis, we should recognize in hypertrophic pyloric stenosis the ultimate results of a pathological process whose first stage is represented by an excessive functional activity of the pyloric musculature; its second stage by hypertrophy and spasm of this musculature and the third stage by a general overgrowth of the normal constituents of the involved parts.

All the surgical evidence presented by the detailed cases favors such an interpretation of the conditions.

Collecting all the cases reported as operated upon, the results of the various operative methods adopted yield the following mortality rates: pylorectomy, 100 per cent; gastroenterostomy, 66⅔ per cent; pyloroplasty, 50 per cent; divulsion, 33⅓ per cent.

These percentages, while only approximate, possess a farreaching significance, especially from the clinical point of view.

I would direct especial attention to two features presented by the published statistics.

First, that divulsion and pyloroplasty yield the smallest death rate.

Second, that the reported cases in which these two procedures proved successful represent the youngest patients operated upon.

To the uninitiated it would appear that these facts would simply speak in favor of these two operations under all circumstances presented by this condition; the true significance, however, of these facts becomes apparent, if we recall the steps of the two procedures mentioned and the conditions presented by a typical hypertrophied pylorus, such as is submitted for your inspection.

Omitting the minuter technical details it will suffice to state that divulsion, also called pylorodiosis or Loreta's operation, consists in making a small incision near the pylorus through which a forceps is introduced and passed *through the stenosed pyloric orifice;* its blades are then separated, the tissues stretched widely without rupture of the serous coat and the incision closed.

In pyloroplasty, an operation especially advocated, to the exclusion of all others, for this condition by Clinton Dent, a larger incision is made as in the above operation and in the place of a dilating instrument, a knife is inserted through the stenosed pylorus and the incision is extended through this, outward into the healthy duodenum, thus splitting the anterior wall of the pylorus; the edges of this incision are drawn widely apart, transposing the long diameter of the wound from the longitudinal to the transverse, in which position the parts are sutured.

Both operations demand a pyloric lumen of a degree sufficient to permit the passage of a dilating instrument in the one and a knife in the other, and in addition a sufficient laxity or distensibility of the tissues to admit of adequate divulsion in one procedure and proper sutural coaptation in the other.

Keeping these essentials in view, let us examine our specimen. We find a hard, infiltrated, unyielding, irregularly ovoid mass, slightly over one inch long, *with a lumen barely permitting the introduction of a fine probe.*

It is evident that no dilating instrument or knife could possibly traverse such a lumen; no method known to modern surgery could possibly augment its calibre, and thus the conviction is at once forced upon us, that the cases reported as cured by divulsion or pyloroplasty either do not belong into the category under consideration or, reasoning along the lines indicated above, represent the spastic state or early stages of this disease; the last conclusion is sustained by the fact that the cases reported as cured by these procedures represent the youngest of the infants operated upon; one as early as the sixth week.

Divulsion and pyloroplasty simply sever the circular muscle fibres of the pylorus, the one by tearing, the other by cutting, in this manner relieving the spasm and its consequences.

Of the various surgical procedures resorted to for the relief of pyloric stenosis, divulsion and pyloroplasty present those of least magnitude and most promise, but unfortunately they are adapted only to the early or spastic stages of this disease when the child, though younger, is still fairly nourished.

When, however, the condition of true hypertrophic stenosis is reached, the surgeon faces the necessity of resorting to a major hazardous procedure under the most unpromising nutritional con-

ditions. Under such circumstances, nothing short of a complete gastrointestinal anastomosis will prove of avail, and all the various methods of this operation in vogue at the present time find mention in connection with the reported cases.

From its simplicity and rapidity of execution, button anastomosis should find most favor, yet it shows 100 per cent. of failures; these are attributed to the large size of the buttons, productive of impaction and pressure necrosis. Dr. W. Meyer, of this city, has had what he aptly terms "Baby Buttons" made, which according to a personal communication, however, he has not as yet had an opportunity to utilize.

The Finney operation consumes too much time in a condition where delay is of the gravest import, and my own preference under similar conditions in the future would be *gastroduodenostomy* in *two sittings*. At the first of these, slight fixation of the involved parts to the abdominal incision, opening of the duodenum and the insertion of a temporary catheter for purposes of direct feeding.

After a proper interval, depending upon the patient's gain in nutrition and strength, an anastomosis between this opening in the duodenum and the stomach, either by the small button of Meyer or a modification of the Finney operation.

Were I to summarize briefly, my impressions from a practical and theoretical consideration of this condition would be as follows:

(1) Embryologic. Pathologic and clinical facts would indicate that this condition should not be interpreted as congenital and would be better termed infantile pyloric stenosis.

(2) For practical purposes, the condition should be looked upon as presenting three stages:—(*a*) Simple spasm of the pylorus. (*b*) Spasm and hypertrophy of the pylorus. (*c*) Tumefaction and stenosis of the pylorus.

(3) The diagnosis of the first or second stage is extremely important, as it is possible that in these stages medical and dietetic measures may be of curative value.

(4) Medical and dietetic measures should not be tried too long and divulsion be resorted to before the stenotic stage is reached.

(5) The stenotic stage developed, gastroduodenostomy in two sittings if necessary should be the operation of choice.

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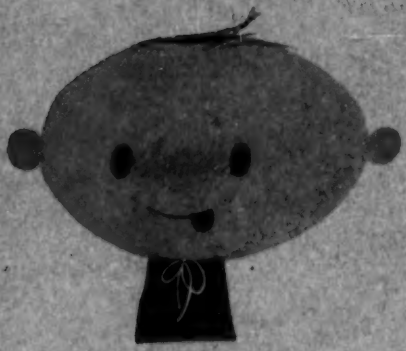

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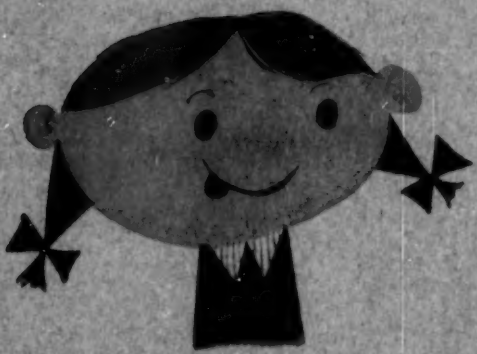

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